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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/612,711	06/30/2003	Yuegang Zhang	884.885US1	3750
21186	7590	01/11/2006	EXAMINER	
SCHWEGMAN, LUNDBERG, WOESSNER & KLUTH 1600 TCF TOWER 121 SOUTH EIGHT STREET MINNEAPOLIS, MN 55402			DUONG, THO V	
			ART UNIT	PAPER NUMBER
			3753	

DATE MAILED: 01/11/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

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Office Action Summary	Application No. 10/612,711	Applicant(s) ZHANG ET AL.	
	Examiner Tho v. Duong	Art Unit 3753	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 05 October 2005.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-18 and 30-41 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-18 and 30-41 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
 Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
 Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 10/5/2005 has been entered.

Claim Objections

Claims 7 and 36 are objected to because of the following informalities: It appears that applicant is claiming a further buffer in addition to the buffer recited in claim 1. It is suggested to clearly recite the additional buffer layer so that there is no confusion or indefinite of what applicant intends to claim. Appropriate correction is required.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 8,9,12, 37,38 and 41 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Regarding claims 9,12,38 and 41, the claimed subject matter of "the length of some of the carbon nanotubes exceed a predetermined gap by a distance established by the height of a spacer inserted in the gap" or "the length of at least some of the carbon nanotubes slightly exceed the width of the gap" renders the scope of the claim indefinite

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since figure 1 clearly shows the spacer (19)'s height, which defines the gap's width is much larger than any length of the carbon nanotubes. It is not clear how the carbon nanotubes can exceed the gap by a distance of the height of the spacer.

Claim 8 and 37 recites the limitation "the buffer layer" in line 1. There is insufficient antecedent basis for this limitation in the claim. It is not clear if applicant is claiming the buffer layer in claim 1,30 or the buffer layer in claim 7 and 36 is a catalyst.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1-8,13-14,16-18,30-37 are rejected under 35 U.S.C. 102(e) as being anticipated by Dubin (US 2004/0265489A1). Dubin discloses (figures 3,6, paragraphs 33-38 and 44) a computer system comprising a Dram, a die (110) including a surface and a circuit; a heat sink (150); a thermal interface (300a) interposed in a gap between the die surface and the heat sink; a metal buffer layer (622 or 642 or solder alloy) formed above a surface of the heat spreader; the thermal interface comprises an array of carbon nanotubes (690) formed above the buffer layer (622 or 642 or solder alloy); the carbon nanotubes (690) are bonded together by metal layer (620); a further buffer layer (622,642 or solder alloy) interposed between the interface and the

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die or between the thermal interface material and the heat spreader (depends on the substrate 610 is a die or a heat spreader or a substrate); the buffer layer comprises a catalyst for carbon nanotube growth selected from the group of Co, Fe and Ni. The catalyst layer is coated on the bottom portion of the carbon nanotubes. Dubin further discloses (paragraph 35) that the buffer metal can be Ti or Chromium.

Claims 1-5,7-13,15,30-34 and 36-41 are rejected under 35 U.S.C. 102(e) as being anticipated by Dubin (US 2004/0150100A1). Dubin discloses (figures 3-8 and 11-12) an apparatus comprising a die; a heat spreader (62) mounted adjacent the die; a metal buffer layer (38 or 70) formed above a surface of the heat spreader; a thermal interface material interposed in a gap between the die and the heat spreader; the thermal interface material comprising an array of carbon nanotubes (48) formed above the buffer layer; a further buffer layer (46) of Ni is interposed between the interface material and the die and coated on a bottom portion of the carbon nanotubes; a buffer layer (56) is interposed between the thermal interface material and the heat spreader (62); Dubin further discloses (figure 12) that the length of at least some of the carbon nanotubes (48) slightly exceeds a width of the gap, wherein free end of the carbon nanotubes project from the array to embed them in the coating surface (56) of the heat spreader.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Searls et al. (US 2004/0005736A1) discloses an apparatus using nanotubes for cooling and grounding die.

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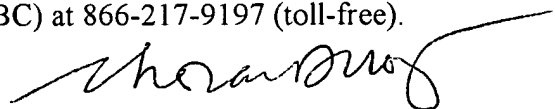
Engelhardt et al. (US 2003/0179559A1) discloses a carbon nanotubes thermal interface material.

De Lorenzo et al. (US 2003/0231471A1) discloses an increasing thermal conductivity thermal interface.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Tho v. Duong whose telephone number is 571-272-4793. The examiner can normally be reached on M-F (first Friday off).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Stephen Blau can be reached on 571-272-4406. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Tho v Duong
Primary Examiner
Art Unit 3753



TD
January